tinct. When it was absent, dark lines, following the direction of the lateral axes, were visible in some cases. Frequently an indistinct striation was present. GILBERT RIGG.

Manchester Museum, Mineralogical Department,
January 12.

A Tortoise inclosed in Ice.

I SHOULD like to be allowed to record a case of a water-tortoise surviving an incarceration in ice, somewhat similar to that given in NATURE (vol. xliv. p. 520).

In this instance, the tortoise has hibernated in a stone basin, in which there were about 6 inches of water and a quantity of dead leaves. The whole was, I believe, frozen into a solid mass. At any rate, when, on December 29, I examined a cake of ice and leaves, from 2 to 3 inches thick, which was floating in the basin after a thaw, I found the tortoise with its back embedded in the *under* side of the mass, and with nearly 2 inches of porous-looking ice above it. The animal, though torpid, was alive, and I replaced it in the basin. Later on it put its nostrils up to the surface, and two days afterwards was seen with its head out of the water as usual. It remained in the pond, which has been again frozen over, in less than a week after this observation. FRANK FINN.

31 Walton Crescent, Oxford, January 22.

Alpine Rubi.

IN a footnote in NATURE (vol. xlv. p. 10) it is stated that "The two highest-known species of *Rubus* are *pinnatus* and *rigidus*, at 5000-6000 feet." This is hardly correct, unless it is intended to refer to African species only. In South America, *R. megallococcus*, *R. boliviensis*, *R. bogotensis*, and *R. roseus* occur at 8000 feet, and *R. rusbyi* at 10,000. In Colorado I have found *R. strigosus* above 10,000 feet (see *Bull. Torrey Bot. Club*, 1890, p. 10; 1891, p. 169). In the Indian region, *R. ellipticus* goes to 7000, *R. lasiocarpus* to 8000, and *R. biflorus* and *R. rosifolius* to 10,000 feet.

The name of the wild *Zea* is *Z. canina*, Watson (local name, "mais de coyote"), not *nana*, as given in NATURE, vol. xlv. p. 39. T. D. A. COCKERELL.

Institute of Jamaica, Kingston, Jamaica,
December 30, 1891.

UTILIZATION OF HOMING PIGEONS.

THE utilization of the homing instinct of the domesticated varieties of the blue rock pigeon, the *Columba livia*, for military purposes, has been effected by most of the Governments in Europe. In France, Germany, Austria, Switzerland, Italy, Spain, and Portugal the organization has been very complete. It has even extended to Russia, Denmark, and Sweden; and Africa has been brought into communication with Spain by stations at Ceuta and Mellila. England alone, of all the great Powers, has neglected this important mode of communication, which is available under circumstances that preclude the employment of any other means.

It cannot be said that they have not been brought under the notice of the military and naval authorities. Nearly twenty years ago, on the occasion of the despatch of a flight of seventy-two birds from the Crystal Palace to Brussels, when the first birds arrived before the telegram which was sent to announce their departure, I wrote a letter to the *Times* of June 27, 1873, calling attention to their utility, and asking the question: "What would be the value of the birds, in the event of a war in which we may be engaged, that would convey messages to or from Guernsey, Jersey, and other places, when the submarine wires had been cut by the enemy?"; and in a lecture delivered by me before the Royal Engineers' Institute at Chatham, on the use of pigeons for military purposes, I entered at some length into their mode of training and general utilization.

The employment of the *Columba livia* depends upon several conditions which are not without interest. In the first place, this species is one of the comparatively few capable of domestication, a faculty which is totally distinct from, though frequently confounded with, the facility of being tamed. A domesticated animal is attached to its home, and returns to it of its own will; a tame animal is merely familiar with man. These two states are admirably illustrated in the closely allied species, the fowl and the pheasant. Both were originally perfectly wild, but when domesticated the chickens invariably return home to roost, while the pheasants, though descended from numberless generations of birds bred in confinement, have no attachment whatever to the place of their birth or rearing.

In its natural habitat (the rocky cliffs of the sea-shore) the blue rock pigeon has to fly long distances in search of food, which, when breeding, it stores up in its crop and carries home to its young. This necessitates strong powers of flight and well-developed perceptive faculties, it being guided in its return solely by sight, and not, as is often supposed, by any special instinct.

The pigeons that are used for carrying messages are bred solely for that purpose. A process of artificial selection, as rigorous and remorseless as that of nature, is followed. The young birds, after acquiring their power of perfect flight, and learning the contour of the country in their circuits around their home, are taken in the direction in which it is desired that they should fly, and trained stage after stage until they know every locality over which they have to traverse. This training is absolutely necessary, if their return home is to be depended on. During its performance the inferior birds, those whose intelligence and determination are not well developed, are lost; and the best birds, only, retained. This loss, in the long-distance flights which are flown by the Belgians and by the best homing pigeon societies in England, is very severe. Old birds, that know large tracts of country well, may be taken in new directions, provided they are not too extended, with safety, but young birds that have not been trained would almost certainly be lost if carried many miles from their home.

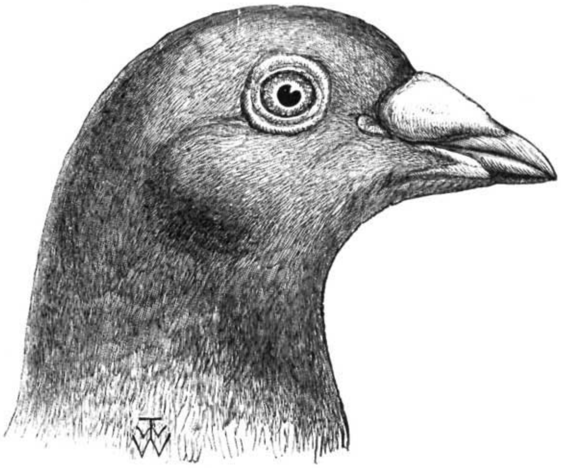

FIG. 1.

Every homing pigeon flyer recognizes the hereditary character of this acquired faculty, and will give a very high price for birds descended from parents that have flown long distances, whereas he would not purchase another bird of precisely similar appearance were he not acquainted with the performances of its ancestors. The fancy varieties of pigeons, especially those which are called carriers in England, are perfectly useless for the purpose of flying distances.

The birds that are most valued are almost all descended from the homing pigeons, *les pigeons voyageurs*, of Belgium, in which country the sport of pigeon racing has been carried on for many years, and has attained its highest development. Pigeon races, in which thousands of birds are engaged, take place annually from the south of France, a distance of five hundred miles, to Brussels and the neighbouring parts of Belgium. The birds are characterized by a well-developed brain, hard, firm plumage, great breadth of the primary and secondary flight feathers, and large pectoral muscles. Fig. 1 is an accurate portrait of a homing pigeon formerly in my possession that had repeatedly flown from the south of France to Brussels. Their rate of flight, for long distances, depends, of course, greatly on the weather. With a strong adverse wind their progress is necessarily slow compared with what it is when the wind is in their favour, but the rate of the winners may be taken from eight hundred to thirteen or fourteen hundred yards per minute. In favourable weather the races from the south of France to Brussels are usually accomplished by the winners in one day, the pigeons never flying after eight o'clock in the evening, the birds being liberated at daylight in the morning. Fog and mist, hiding the surface of the country, are fatal to rapid progress.

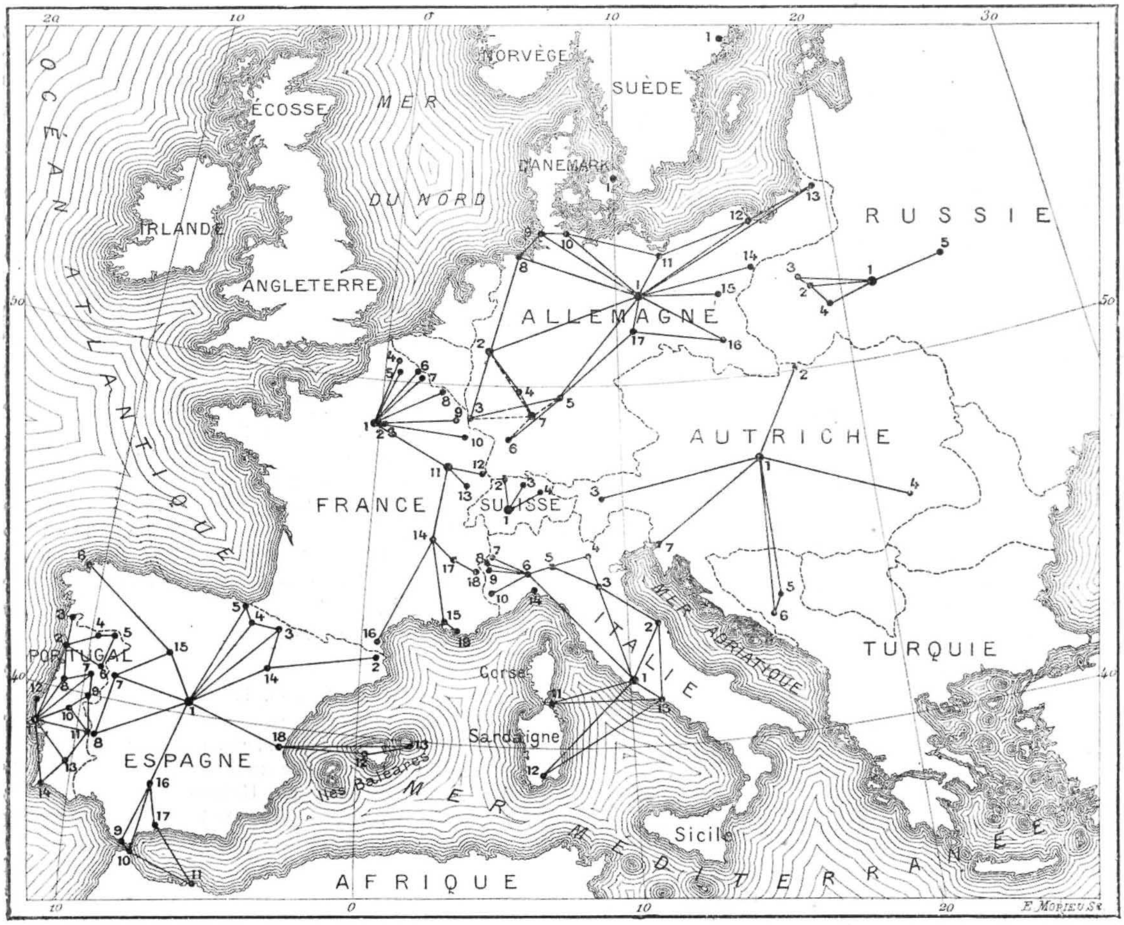

FIG. 2.[1]—CHART SHOWING THE SYSTEM OF MILITARY PIGEON POSTS IN THE CONTINENTAL KINGDOMS.

FRANCE: 1, Mont Valérien; 2, Paris; 3, Vincennes; 4, Lille; 5, Douai; 6, Valenciennes; 7, Maubeuge; 8, Mézières; 9, Verdun; 10, Toul; 11, Langres; 12, Belfort; 13, Besançon; 14, Lyon; 15, Marseille; 16, Perpignan; 17, Grenoble; 18, Briançon.
PORTUGAL: 1, Lisbonne; 2, Porto; 3, Valence; 4, Chaves; 5, Bragance: 6, Almeida; 7, Guarda; 8, Coimbre; 9, Castello Branco; 10, Abrantès; 11, Elvas; 12, Peniche; 13, Beja; 14, Lagos.
ESPAGNE: 1, Madrid; 2, Figueras; 3, Iaca; 4, Pamplona; 5, Oyarsun; 6, Ferrol; 7, Ciudad-Rodrigo; 8, Badajoz; 9, Tarifa; 10, Ceuta; 11, Melilla; 12, Palma; 13, Mahon; 14, Zaragoza; 14, Valladolid; 16, Cordoba; 17, Malaga; 18, Valencia.
ITALIE: 1, Rome; 2, Ancone; 3, Boulogne; 4, Vérone; 5, Plaisance; 6, Alexandrie; 7, Mont Cenis; 8, Fenestrelle; 9, Exiles; 10, Vinadio; 11, La Maddalena; 12, Cagliari; 13, Gaeta; 14, Gênova.
SUISSE: 1, Thun; 2, Bâle; 3, Zurich; 4, Weesen.
ALLEMAGNE: 1, Berlin; 2, Cologne; 3, Metz; 4, Mayence; 5, Wurtzbourg; 6, Strasbourg; 7, Schwetzingen (en projet); 8, Wilhelmshaven: 9, Tonning 10, Kiel; 11, Stettin; 12, Dantzig; 13, Kœnigsberg; 14, Thorn; 15, Posen; 16, Breslau; 17, Torgau.
AUTRICHE: 1, Comorn; 2, Cracovie; 3, Franzenfeste: 4, Karlsburg; 5, Serajewo; 6, Mostar; 7, Trieste.
DANEMARK: 1, Copenhague.
SUÈDE: Carlsborg.
RUSSIE: 1, Brest-Litovsk; 2, Varsovie; 3, Novo-Georgievsk; 4, Ivangorod; 5, Luninetz.

It is sometimes alleged that sight can be of no avail when birds are liberated some hundreds of miles from their home, but it should be remembered that from an elevated position in the atmosphere immense distances can be seen. Mr. Glaisher records that from a balloon he saw at the same time the cliffs of Margate on the west,

---

[1] We are enabled by the courtesy of the editor of *La Nature* to reproduce this map.

Brighton on the south, and all along the coast-line to Yarmouth on the north.

The homing-by-instinct theory is entirely disproved by the races which have taken place from Rome to Belgium, a distance of between eight and nine hundred miles, nearly half of which was over country entirely new to the birds. All the birds engaged in these races had been flown from the south of France to Belgium, whence they would have found their way back in one or two days, but of the hundreds liberated in Rome, not one returned before eleven days, and in the first race in a fortnight only four out of the number despatched. The country was new to them, and doubtless they circled about in search of some known landmark which would have directed their flight; but the objects with which they were acquainted were hidden from them by the Alps, and it was only those few that, flying along the coast, succeeded in reaching the south of France, and then saw objects with which they were acquainted, that returned to their Belgian homes.

The first extensive practical application of the homing faculty of these birds took place when Paris was environed by the German army. During the siege, as is well known, balloons were continually despatched from Paris, carrying not only passengers, but bundles of letters, and the homing pigeons belonging to a few private individuals resident in Paris. In the first instance the despatches returned by these pigeons were photographed on paper and sent from Brussels into Paris. After a time a distinct pigeon post was organized from Tours, outside the German lines. This pigeon post was recognized by the English postal authorities, and letters at the cost of half-a-franc a word were sent from Tours into Paris with as great a degree of rapidity as the pigeons could be sent out by balloon, and conveyed from the places where they descended to Tours, for the purpose of being reflown into Paris. The letters, which were limited to twenty words, were set up in type, micro-photographed on thin films of collodion, inclosed in small quills, and attached to one of the tail feathers of the bird. So complete was this organization that one pigeon could have carried into Paris the whole of the many thousand letters that were sent in during the siege.

The Germans were not slow to utilize the services of the pigeons for military purposes, and at the present time every large fortress in Germany has its pigeon loft, and the birds are trained to fly back from the surrounding country for distances of many miles.

As will be seen by the accompanying map (Fig. 2), pigeons are trained to Berlin from all the large fortresses in the Empire, Strasbourg on the south to Kœnigsberg on the north. Then, again, each fortress has its own loft of pigeons, which are trained to fly back to it, so that before a fortress is completely invaded by the enemy a number of birds can be sent out, or forwarded subsequently by balloon. On being liberated with despatches, these would return to the fortress, without the possibility of their being interfered with. A similar organization prevails in France, pigeons having been trained from Paris to all the military stations on the German frontier; and it may be observed that in Italy, Austria, and even Russia the same system prevails. In our own country there is no definite organization of pigeons for military purposes. It is true pigeon flying has become a popular pastime with a large number of persons. There is scarcely a town in the kingdom where some good homing birds do not exist, which could be placed at the disposition of the military or naval authorities. One great use of the birds would be on the cruisers sent out to watch an enemy's fleet. It is obvious that each could readily take a number of pigeons on board, and, without leaving its post of observation, could send back day by day messages to the town from whence the pigeons were received.

It is doubtful whether any purely military organization could take as good care of the pigeons, and could train them in a manner superior to that which is done by those who use them for racing purposes. No military or naval servant, unless he were a lover of pigeons, would train them with the same amount of interest and care that is done by the amateurs.

In this country, at the present time, there exists a very large number of pigeon-flying Societies. Their races extend from the midland counties in England as far as Cherbourg, and other parts of France. In actual practice the birds would not be, except under very rare occurrences, required to fly very long distances. Of course these long flights necessitate a considerable amount of risk, but good pigeons can be calculated on to return from fifty to a hundred miles with certainty.

On looking at the map it will be seen that no lines showing the military organization of pigeons appear in Belgium; in fact, it is hardly thought necessary that any distinct organization should take place there, as it is supposed that there are in Belgium alone more than six hundred thousand homing pigeons belonging to private individuals, all of which are well trained, and would, in case of war, be placed at the disposition of Government.

W. B. TEGETMEIER.

NOTES.

THE Committee which has been formed for the purpose of obtaining a portrait of Michael Foster, Secretary of the Royal Society, and Professor of Physiology in the University of Cambridge, has issued a second list of subscriptions. It is intended that the picture shall be presented either to the University or to Trinity College, as the subscribers may decide. The treasurer is Dr. Lea, Gonville and Caius College, and subscriptions may be paid either to him or to Messrs. John Mortlock and Co., Bankers (Limited), Bene't Street, Cambridge. Cheques should be made payable to the "Michael Foster Portrait Fund."

AT the meeting of the Cambridge Philosophical Society on Monday, January 25, Prof. G. H. Darwin, President, in the chair, the following resolutions were proposed by Prof. Cayley, seconded by Dr. Lea, and passed unanimously:—"(1) That the Cambridge Philosophical Society desires to express its sense of the great loss sustained by the University and the Society by the death of Prof. Adams, who shed lustre on the Society by the brilliancy of his scientific career, and set an example to its members by the earnestness and simplicity of his life. (2) That the Society do now adjourn without transacting the business of the meeting, as a mark of respect for the memory of Prof. Adams, one of the benefactors of the Society. (3) That the President be instructed to convey the foregoing resolutions to Mrs. Adams."

WE have heard at present of only one astronomer as candidate for the Professorship of Astronomy rendered vacant by the death of Prof. Adams; this is Mr. Turner, Chief Assistant at Greenwich. On the other hand, we hear of some mathematicians; it is not stated, however, what contributions to the science they have made.

THE late Ferdinand Roemer, the well-known geologist and Professor at the University of Breslau, whose death on December 14, 1891, we have already recorded, intended to have celebrated on May 10 next his jubilee as a Doctor of Philosophy; and his friends, admirers, and pupils were preparing to do him honour on the occasion. It is now proposed that a marble bust of Roemer shall be placed in the Mineralogical Museum of Breslau, and an influential committee has been formed for the purpose of collecting subscriptions.

THE Committees appointed last year by the Royal Society and by the British Association for investigating the zoology of